QH
1
N314X
NH

FRINGED GENTIAN
Baltimore County, Md.

Photographed By
C. Haven Kolb, Jr.

MARYLAND NATURALIST

The Natural History Society of Maryland

VOLUME XXII Nos. 1 AND 2 1952

MUSEUM OF NATURAL HISTORY
MARYLAND HOUSE DRUID HILL PARK
Open daily 10 A. M. to 5 P. M. except Monday.

MARYLAND NATURALIST

Then here's to the oak, the brave old oak,
Who stands in his pride alone!
And still flourish he, a hale green tree,
When a hundred years are gone!

H. F. Chorley - *The Brave Old Oak*

PUBLISHED by THE NATURAL HISTORY SOCIETY OF MARYLAND
2101 - 2103 BOLTON STREET, BALTIMORE, MARYLAND
WINTER, SPRING, SUMMER, FALL

VOLUME XXII Nos. 1 and 2

1952

Northern Red Oak
(Quercus borealis)
Loch Raven, Md.

Photographed by
C. Haven Kolb, Jr.

OAK WILT - A CONTEMPORARY THREAT

by

Hollis Howe

Diseases of plants, like those of humans, appear to offer their challenge from time to time and are often fully as baffling. The chestnut blight, the planetree canker, the dogwood twig-blight and the Dutch elm disease are all examples of tree diseases that threaten these several species in varying degree. The chestnut blight might well be compared to the "flu" epidemic which was so fatal to man in 1918 and 1919. The others, not unlike certain human ills, are more or less amenable to control by employing certain sanitary and therapeutic measures, thanks to painstaking research. Now we are confronted with a wilt of oak trees which calls for earnest effort if it is to be held in check.

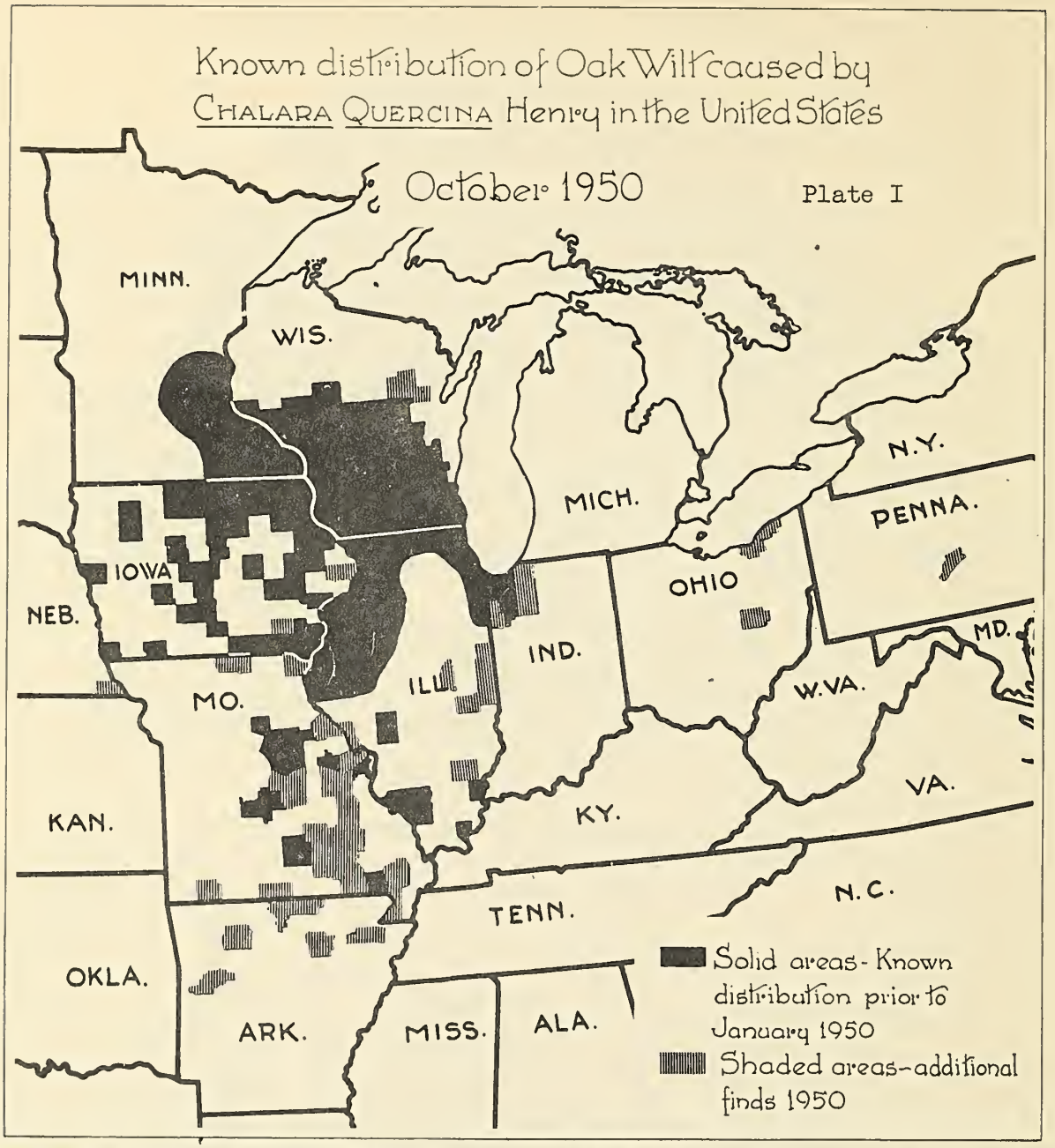
As has been the case with certain other tree diseases, it was more or less casually observed long before it caused any considerable concern. It appears to have been described in the London Quarterly Journal of Forestry in 1929, by Dr. Tieman, as occurring on his property at Wisconsin Dells, Wisconsin. Farmers there had directed attention to their wood-lots where oak trees had been dying in ever expanding areas for years (1). It was not until 1935 that the disease aroused research interest and not until 1942 that it was definitely established that it is caused by a specific fungus. Studies are now being undertaken in the state experiment stations in Ohio, Illinois, Iowa, Wisconsin and Missouri, In the latter state is the northern limit of a commercially important oak belt, extending to the Gulf of Mexico.

Research was slow to develop during the early period of the existence of the disease, presumably due to the fact that mostly inferior stands were affected. It is now viewed with sufficient seriousness to cause oak-using lumber interests to provide funds for its study. There is no substitute for oak for such things as railroad ties, for example.

Oak wilt is now known in eighteen states: Minnesota, Wisconsin, Iowa, Nebraska, Kansas, Missouri, Arkansas, Illinois, Indiana, Michigan, Ohio, Pennsylvania, Maryland, West Virginia, Kentucky, Tennessee, Virginia and North Carolina, (2). The known distribution of oak wilt in October, 1950 is shown on the map (Plate I.) The disease was found in seven new states in 1951, as follows: West Virginia (17 counties), Southern Michigan (12 counties), Eastern Tennessee (6 counties), western North Carolina (2 counties) and in 1 county each in western Maryland, western Virginia and northeastern Kentucky.

The most important observation that has come out of the discovery of the disease in the eastern states relates to the age of the infections, (2). Oak wilt has probably been present in the upper Mississippi Valley states for 30 years or more - possibly 50 years. Aerial photographs, which were taken in color, show large infection centers in Wisconsin, for example, but in the eastern states all infection centers so far discovered are small and of relatively recent origin. It is felt that the oak wilt disease must be regarded as having invaded the eastern oak producing territory within the last 10 to 20 years. The virulence of the fungus on red oak makes it seem improbable that the fungus has been with us always.

MAR 1 2 1953



Courtesy of Edgar G. Rex, Plant Pathologist, N. J. Department of Agriculture

The United States Department of Agriculture is now actively engaged in research, following an appropriation of $35,000.00 for the work. Their laboratory is in Columbia, Missouri, in co-operation with the Missouri Agricultural Experiment Station. Other work is being done at the experiment stations at Wooster, Ohio; Madison, Wisconsin; Ames, Iowa and Urbana, Illinois.

According to early information, the cause of oak wilt was attributed to a fungus known as *Chalara quercina* (Henry). Four other species of this genus, all saprophytes with oak as the host, have been described. The

morphology of each appeared so distinctive that the species *quercina* (1), (3), was readily recognized.

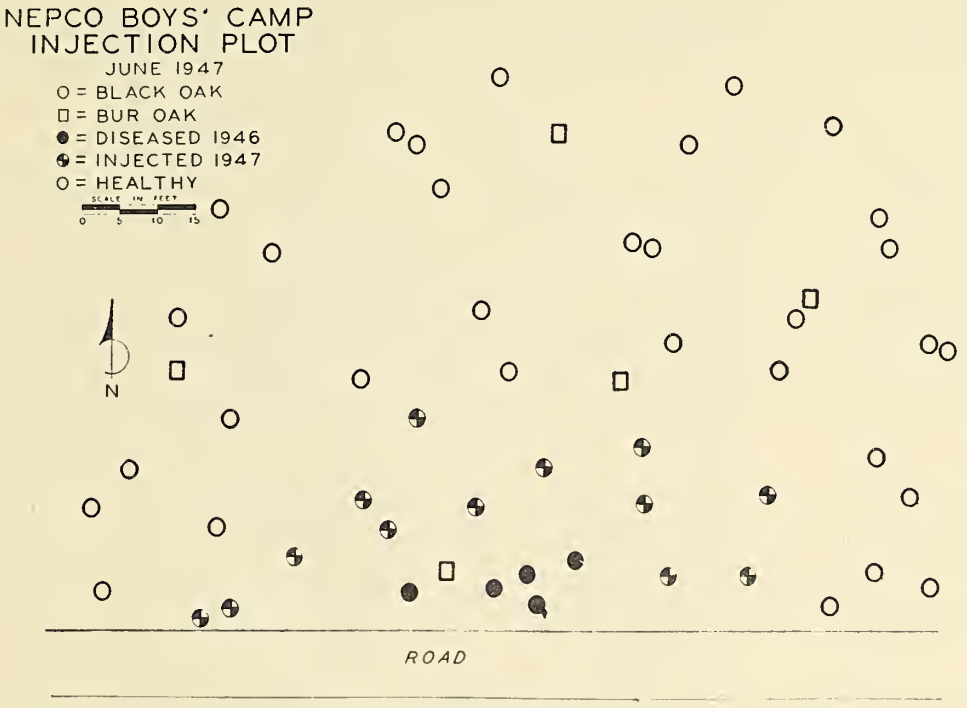


Plate II

Diagram of an experiment to control oak wilt in a local area by poisoning healthy trees adjacent to wilting trees. Courtesy of J. E. Kuntz and A. J. Riker - "Oak Wilt in Wisconsin."

A capable researcher, Dr. T. W. Bretz, who is stationed at the University of Missouri, found the perfect stage of the fungus this year (2). He is preparing a description of it at the present time and will give it a new name. It will probably be a *Ceratostomella* or an *Endoconidiophora*. The discovery of the perfect or ascospore stage of the fungus gives a key to what type of behavior may be expected of it and suggests that the disease may have much in common with the Dutch elm disease. Because practically nothing is known about the means of spread of the fungus for long distances, the finding of the perfect stage will be of much help in guiding the plans for research in this regard.

Inasmuch as several states are beginning active research programs this new interest is an encouraging omen that the major gaps in knowledge of oak wilt will be filled in within a reasonable time. Sound information about the disease is needed before the success of control work that is being planned at several places can be assured.

The susceptibility* which permits the infection to become established and the resistance which determines the rate of spread of the fungus

**For susceptibility of other species of oak see Journal of Forestry, Vol. 94, No. 3, March 1951 - "Oak Wilt" by T.W. Bretz (4) and "Oak Wilt", J. R. Hansbrough, Tree Pest Leaflet, Society Amer. Foresters, Hillsboro, N.H.*

from the point of inoculation varies in the two general groups of oaks, commonly referred to as the "black oaks" and the "white oaks". Its toxic effect is much more rapid and more inevitably certain in members of the former. The following taxonomic group classification by Dr. Gordon Day, Rutgers University Forestry Department, of some of the oak species common to the middle Atlantic states will be helpful.

BLACK OAK GROUP		WHITE OAK GROUP	
Botanical Name	Common Name	Botanical Name	Common Name
Quercus borealis	Red oak	*Quercus alba*	White oak
Quercus palustris	Pin oak	*Quercus robur*	English oak
Quercus coccinea	Scarlet oak	*Quercus stellata*	Post oak
Quercus ellipsoidalis	Northern pin	*Quercus lyrata*	Overcup oak
Quercus velutina	Black oak	*Quercus macrocarpa*	Bur oak
Quercus falcata	Spanish oak	*Quercus bicolor*	Swamp White oak
Quercus ilicifolia	Scrub oak	*Quercus muehlenbergii*	Chinquapin oak
Quercus marilandica	Black Jack oak	*Quercus prinoides*	" (dwarf)
Quercus nigra	Water oak	*Quercus prinus*	Chestnut oak
Quercus laurifolia	Laurel oak		
Quercus imbricaria	Shingle oak		
Quercus phellos	Willow oak		
Quercus virginiana	Live oak		

Inoculated trees of the black oak group show symptoms within 15 to 30 days and are killed 60 to 90 days later. In the case of the white oak group, usually only local branch infections occur, several years elapsing before the trees are killed.

Oak wilt produces noticeable leaf symptoms (5) which vary with the species of oak affected. In the case of the black oaks, early symptoms are indicated by a wilting and bronzing of the foliage first in the upper crown, usually extending downward later and are followed by partial defoliation. In some cases practically all the leaves turn brown, whereas in others the tree dies rapidly and little or no defoliation occurs. The leaves may fall in autumn or they may persist until the following summer. In the white oak group often but one or more branches are affected. While symptom expression varies with the two groups, a darkening of the base of the leaf petioles is characteristic of both.

The bronzing of the leaves usually begins at the apex and the tips of the lobes, spreading inward toward the mid-rib. This latter area may have a water-soaked appearance before bronzing begins. Sprouting along the trunk and larger branches may occur before the infected tree dies. The leaves usually become dull or pale green before browning takes place. They tend to remain on the tree rather more often in the case of the white-oak group. Usually, in this group also, the entire tree does not wilt at once and the killing of individual branches over a period of several years results in what is commonly called "stagheading" (7). Many other diseases may be confused with oak wilt and it is necessary that cultures be made to definitely establish the cause. A half dozen twigs 6 to 8 inches in length and one-half to one inch in diameter, freshly taken, are good material for identification. They may be sent to the local state experiment station.

No native oak species is known to be immune to the disease. It is of interest to note that the fungus causing oak wilt has been isolated from Chinese chestnut trees *(Castanea mollissima)* growing in a plantation in Missouri, (7). This may complicate the problem of finding a dependable variety of chestnut, (8, 9, 10), inasmuch as this Chinese chestnut had been selected because of its immunity to the Chestnut blight, an entirely different disease.

The way by which the fungus spreads from one location to another, sometimes as much as a mile, is not known. Not until the fungus is found fruiting externally on dead or dying oak will this be determined, perhaps. The pattern of spread does not suggest dissemination by the wind, but it may be spread by insects, birds, rodents or other means. Sanitation through the destruction by burning of diseased trees is suggested. It was advocated early that diseased wood not be stored against healthy trees in the open. (11). This has since been found to be unnecessary precaution (12). Inoculation has not as yet been accomplished through healthy bark.

Discoloration of the wood proper does not ordinarily accompany the early leaf symptoms; but, by peeling back the bark of infected twigs, a browning or longitudinal streaking is usually present. This discoloration does not, however, necessarily prove that oak wilt is present, as other diseases may cause similar discoloration.

A local type of spread from diseased to healthy trees is accomplished by means of naturally grafted roots. Control of such spread has been brought about both mechanically, by chiseling or trenching, and chemically, by poisoning with sodium arsenate or Dupont's Ammate, the latter being less dangerous to game animals. See Plate II (9). In one instance it was determined that the disease moved about 300 feet in 8 years along a row of mature trees. Root grafting of trees 28 feet apart has been reported (1).

Dr. W. F. Jeffers of the University of Maryland (13) organized a survey party which included Dr. Curtis May (2) and members of the State Forester's Staff in 1951. As a result an outbreak of oak wilt was found on Savage Mountain, near the new Savage River Dam, Garrett County. Later, Dr. Jeffers organized a survey which was conducted by volunteers from the Civil Air Patrol. This operation was carried out on September 9, 1951. Fifteen different aircraft participated and logged a total of 24 flying hours of scouting. Nine hundred square miles, chiefly in Garrett and Allegany Counties, were accurately observed. This was done by assigning each plane a sector covered by a large scale U. S. Geological Survey map. Each plane carried an observer familiar with trees.

Thirty-nine locations containing one or more trees considered sufficiently suspicious to warrant ground inspection were located and plotted on the maps. Ground crews from the Forestry Department visited these trees and where appropriate specimens were indicated they were collected and brought in for culture by Dr. Jeffers. Fortunately none

of the samples yielded the oak wilt fungus. Thus it appears that the disease may be localized on Savage Mountain, where it was discovered on July 19, 1951.

The reason for such a large serial survey party was because of the short period remaining before the time when the leaves would begin to turn brown naturally. About a month had elapsed between the time when the original infection was discovered and definite confirmation was obtained by laboratory studies. This aerial scouting is to be continued in 1952 but begun earlier.

In addition to the samples collected as a result of the aerial survey, many other suspected oaks were examined and samples cultured. Fortunately, all of them proved to be negative. It is proper that we continue to be on the alert.

Transmission of the disease by the use of lumber from infected trees seems rather remote as the portion affected is usually trimmed off at the mill. Viable fungus has not been recovered much more than six months after death of the tree involved. Dead stumps may be a source of infection for as long as two years, however (1).

Late Summer infected nursery stock, particularly in the white oak group, might be symptomless during the nursery inspection period and hence be certified for inter-state shipment (1). It is agreed, it is believed, that the discontinuance of planting of oak trees is not an important precaution at this time at least. It might be advisable, however, to be sure that the stock to be planted does not originate in a heavily infected area. Disconcerting as this all may seem, we should not let it take our attention from the Dutch elm disease, which is a much more imminent threat to our tree life today.

Literature Cited:

(1) "A Report on Oak Wilt", Edgar G. Rex, Eastern Plant Board, Oct. 1950.
(2) _____, Curtis May, Principal Pathologist, Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Dept. of Agriculture, Beltsville, Maryland, January 1952.
(3) Plant Disease Reporter, Vol. 35, No. 7, July 15, 1951.
(4) "Oak Wilt", T. W. Bretz, Journal of Forestry, Vol. 49, No. 3, March, 1951.
(5) "Oak Wilt", J. R. Hansbrough, Tree Pest Leaflets No. 55, June, 1950, New England Section, Society of American Foresters, Hillsboro, N.H.
(6) "Surveys for Oak Wilt", Marvin Fowler, Plant Disease Reporter, Vol. 35, No. 2, February 15, 1951.
(7) "Oak Wilt - Recognition & Collection of Specimens", T. W. Bretz, National Oak Wilt Research Commission, P. O. Box 373, Memphis, Tenn.
(8) Plant Disease Reporter, Vol. 35, No. 1, January 15, 1951.
(9) "Recent Developments in Oak Wilt Research", James E. Kuntz, Trees Magazine, July-August, 1951.
(10) Plant Disease Reporter, Vol. 34, No. 10, October 15, 1950, Bretz & Long.
(11) Plant Disease Reporter, Vol. 35, No. 1, Jan. 15, 1951, Bretz.
(12) Farmer's Bulletin No. 1987, March, 1948.
(13) _____ _____, W. F. Jeffers, Professor of Plant Pathology, University of Maryland, College Park, Maryland, January, 1952.

ECOLOGY OF A BARE HILLS CAVE

Bare Hills, Maryland

by

Joseph F. Schreiber, Jr.

The ecological survey on which this article is based was begun in late October, 1949, and was terminated the middle of January, 1950, as one of the requirements for an invertebrate ecology course at the Johns Hopkins University. The survey was limited to one cave and the area immediately surrounding its mouth. Specimen collections were made. Observations of air temperature inside and out, water temperature inside and out, temperature of a nearby stream, and relative humidity inside and out were noted. The area and cave are described.

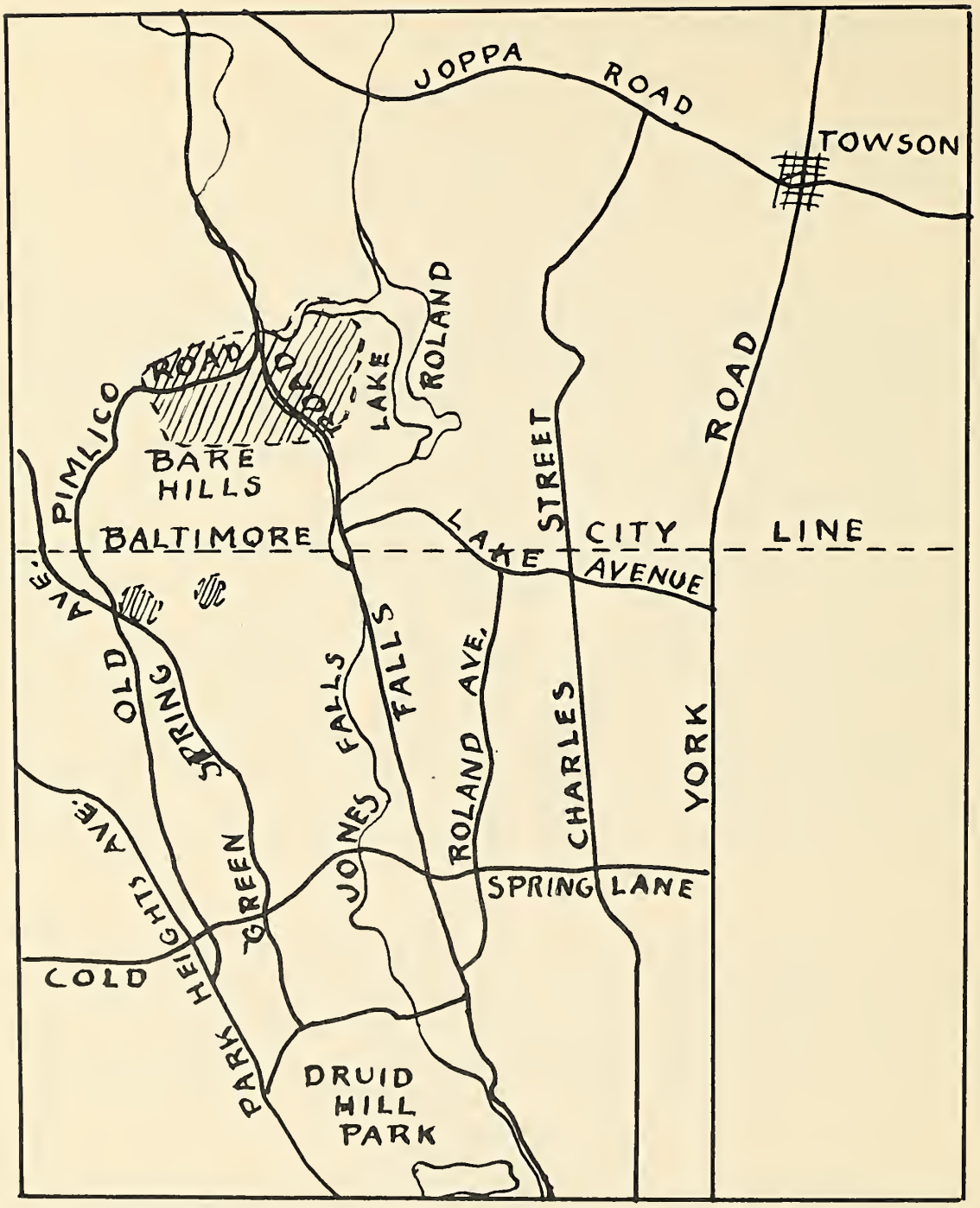
The Bare Hills area has long been known to naturalists, boy scouts, and hikers in general, walking out from Baltimore by way of Falls or Old Pimlico Roads. The author has visited it several times a year beginning in 1937, chiefly in quest of mineral specimens. In more recent years the Natural History Society of Maryland has collected much flora and fauna from the area during all the seasons. One paper (Bures, 1948) has been published by the Society and deals with the mammals. Notes on the other life are on file and specimens have been carefully preserved and cataloged at the Society's headquarters. This paper is an attempt to bring together some of those records along with the author's own field observations during the months of October, November, December, and January, 1949-50.

The author is grateful to the Natural History Society of Maryland for use of its collections and notes and to those members who helped answer the author's many questions. Special thanks goes to the Department of Herpetology. Dr. V. G. Dethier of the Department of Biology at the Johns Hopkins University furnished or checked several identifications and counseled the author throughout the period. Mr. Romeo Mansueti of the Natural History Society aided much in some revisions.

THE BARE HILLS AREA

The Bare Hills area (Plate I, II), so named because of the barren nature of the country, is situated just north of the Baltimore City limits on both sides of the Falls Road. These "barrens" are stretches of uncultivated country which support only a sparse growth of grasses, field weeds, scrubby oak *(Quercus marilandica)* and pine *(Pinus virginiana)*. They stand in marked contrast to the rich and prosperous farm lands of the rest of the Piedmont Plateau.

The underlying rock is serpentine, a metamorphic rock derived from the hydrothermal alteration of a basic igneous rock such as gabbro, peridotite or pyroxenite.



The Bare Hills Area Plate I

It is believed that the sterility of the soil is due to the chemical composition (Johannsen, 1928; Matthews, 1929) of the serpentine which is a hydrous magnesium silicate with lesser amounts of iron oxides; thus it lacks the potash and soda necessary for the nutrition of plants. Owing to the nature of the rock it decomposes very slowly and the decomposition products are washed away nearly as fast as they are formed.

Actually there is little soil on the slopes and most of it is found in the interstices of the dull, fractured, greenish-yellow rock. The

soil color varies from deep-red to yellow to yellow-green to bluish-green. The hills are a network of large bare patches and grass clumps. Along the streams in the valleys where the soil is thicker and has been enriched by other organic matter, greener vegetation including much honeysuckle, a few wild berry bushes and small trees grow well.

The streams in the area are spring fed, flowing all year round except in periods of extreme draught and empty to the east into Jones Falls and Lake Roland.

Two quarries, one on each side of Falls Road at Old Pimlico Road, have been worked for crushed rock in past years. In 1947, a stone crusher was erected on a hill to the west of Falls Road and quarrying was revived temporarily. Early in the nineteenth century Isaac Tyson, Jr. mined chrome ore (chromite) which occurred in the serpentine. Many of the surface cuts, shafts, and adits are visible today.

Two of these adits are still open to passage. One lies west of the crusher near the top of the hill. The entrance is a little larger than a man's body and immediately expands to a six by six tunnel which pitches east at twenty degrees for one hundred feet.

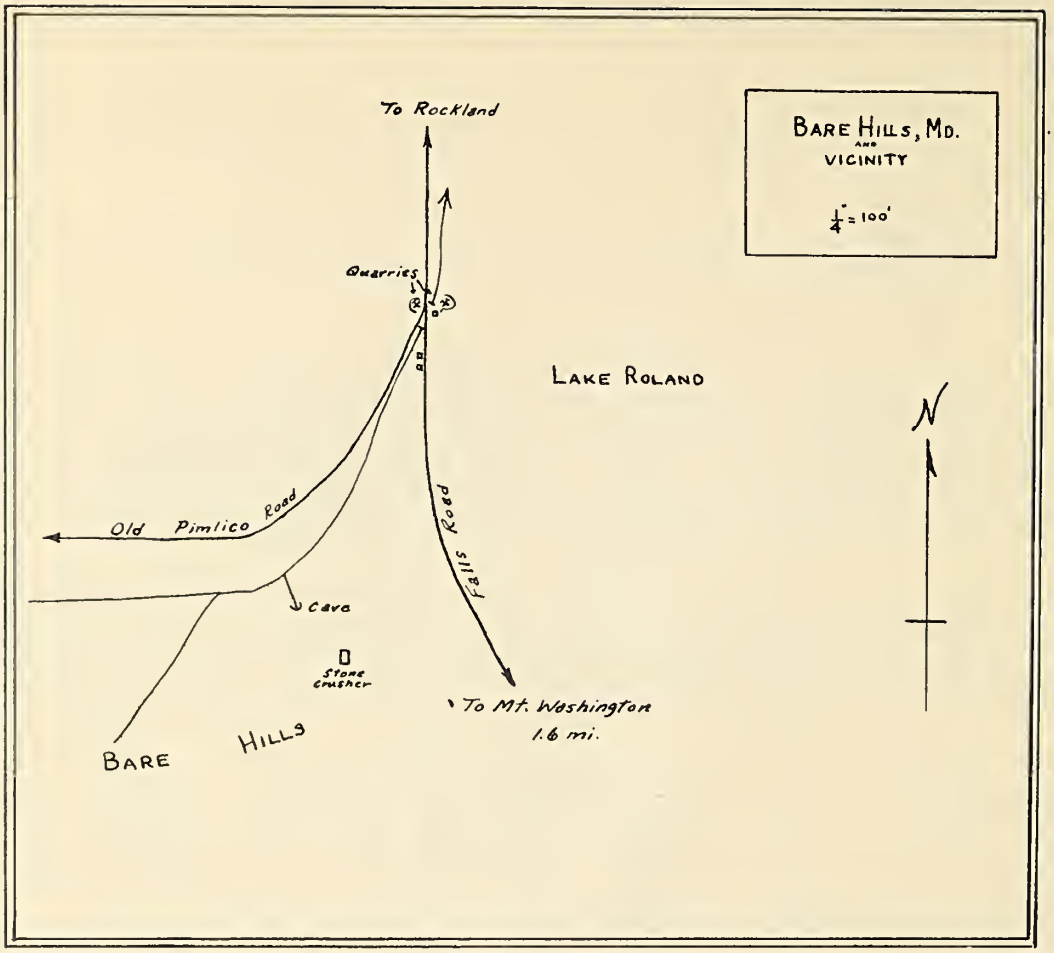
The other adit lies northwest of the crusher in a narrow stream valley and is better known as the "Bare Hills cave". Its entrance is in the face of the hill two to three feet above and twenty-five feet from the stream. The cave is filled with water most of the year and a steady stream flows from it. The remainder of this paper will deal with this cave.

THE CAVE

The cave (Plate III) is actually an adit for a shaft higher up on the hill. The entrance is cut back with vertical walls on each side protecting it from direct sunlight. It runs nearly south for one hundred and sixty-five feet, averages six feet in width and varies in height from six to eleven feet. At the end where the shaft has caved, there is a small room measuring six by twelve by four. This is the only large dry area in the entire length. Since the rock is much fractured and jointed, there are many small cracks in which animals can take refuge and narrow ledges on which they can rest. Otherwise the walls are relatively sheer. The cave is straight except for a bend fifty-four feet from the end. For this reason very little light reaches this part.

Underground springs supply the water in the cave; its level is directly related to rainfall. During the fall, winter, and spring months a continuous stream flows from the mouth. It ranges in depth up to three feet with two feet an average. Variations are due to fallen rock and other debris on the floor. Rain falling on the hill above may enter the cave by moving along the fractures and joint planes. In freezing weather the water forms icicles and ice cascades near the entrance. Bures (1948) gives a cross section showing ceiling heights and water level for the winter months. In the summer the level drops considerably

Plate II



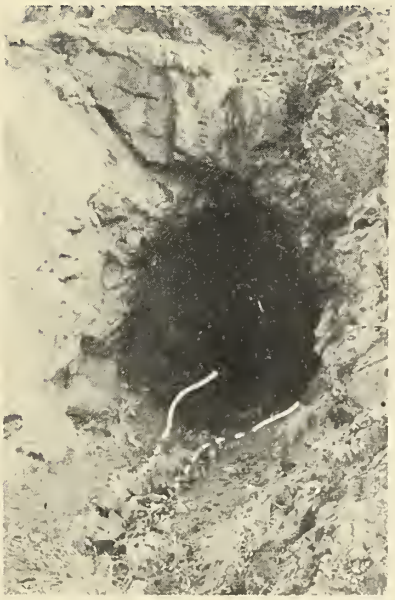
View looking NW from hill above cave. Trees are growing along the main stream. Note the stunted pine growth on the opposite slope.

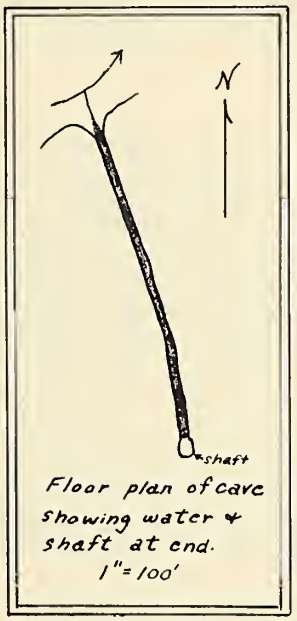
View looking up narrow stream valley which runs NE-SW. Note the barren slopes except for grasses and weeds.

and in time of extreme drought the author has seen the cave floor dry up except for scattered pools. The pH of the water was found to be 8.41, a sample having been collected at the mouth. There is a difference in elevation of about two and one half feet between the cave stream and the main stream. Green grasses are more abundant along here.

The area in general and the cave represent an unusual ecological niche. Flora is limited because of the poor soil derived from the weathering of the serpentine. This in turn effects the animal life; food is scarce and there is little ground cover. The cave fauna is even more restricted. Rodents and insectivores, if present, could not use the cave all year round because of the water level barrier. On the other hand the water serves as a home and breeding place for some of the fauna.

Plate III





View of the entrance of the Bare Hills cave. This photo was taken when the water level was down during the summer months. The small pool just inside is level with the white line during the late fall, winter and spring months. Height of entrance is about six feet.

SOME NOTES ON TEMPERATURE AND RELATIVE HUMIDITY.

It was noted that air temperature in the cave is a function of temperature outside. It dropped as cold weather approached in November. Rapid fluctuation of temperature outside does not, however, have a pronounced effect upon that inside. Only over periods of several cold days will the cave air temperature drop to some mark relative to outside temperature. Despite a wide range of outside temperatures of 27 degrees from November 23rd to December 17th the temperature inside only varied over a narrow range of 12 degrees.

The water within the cave seems to be even more resistant to temperature changes. For the entire period from October 23rd through January 11th it has only varied five degrees and has averaged 50°F.; it fluctuates with the temperature of the air above it. The water at the mouth of the cave generally runs two degrees lower than the water inside. Surrounding air temperature is the chief factor determining that of the main stream.

Relative humidity within the cave has run consistently high. This is favorable to many hibernating animals because there is little danger of dessication.

The two previous winters in Maryland had been unseasonably mild. Fauna seen and collected over this period does not necessarily represent the situation as it was several years back. It will be shown that this is particularly true in the case of the bats.

FAUNA

The scanty animal population of this cave has come from the surrounding hills and streams. All of the animals are fitted more or less for cave conditions before entering. Most species are transient, inhabiting the cave over short periods of time for breeding purposes while others spend the winter there in hibernation. Many crevices in the wall of the cave afford excellent hiding places. Food is scarce within the cave itself; the closest food supply would be at the entrance among the green plants, algae, and smaller forms of stream life.

This population differs from one that is confined to a cave from birth to death over many generations. There are no blind species; nor do they possess an unusual development of sense organs or a degeneration of pigment and visual organs.

FAUNA INHABITING THE CAVE-

CRUSTACEA

Crayfish *(Cambarus b. bartoni)*

Crayfish live in the waters near the entrance and have been seen as far back in the cave as forty feet. Most are small in size with two inches an average and three and one-half inches a maximum. They have probably entered the cave, following the warmer waters, to search for food and to take advantage of the soft mud floor for burrowing.

INSECTS

No doubt a greater number of insects find their way into the cave during the summer months. The winter list includes four members.

Water strider (Family *Gerridae*)

These hemiptera were common around the mouth of the cave and occasionally one could be seen far back in the darker regions up to the

third week in December. After this they disappeared. This correlates roughly with the pre-Christmas cold snap. Mansueti notes that *Gerris remegis* is abundant.

Tent caterpillar moth (Family *Lasiocampidae*)

Malacosoma americana (?) was in hibernation when the cave was first visited in October. They could still be seen in the later months resting on the ceiling, their pale orange bodies standing out against the drab rock in the beam of a flashlight.

Mosquito (Family *Culicidae*)

These insects have been further identified as belonging to genus *Culex* (perhaps *Culex pipiens*). They were still active in late October to early November, clinging to the ceiling and upper walls. By late November they had to be stirred into activity and their numbers gradually decreased during December.

Warble fly (Family *Hypodermatidae*)

These flies were first noted on November 8th in a drill hole one foot above the water level. At that time the author called them "bees" (which they resembled so closely), and thought it would be a good idea if he waited for colder weather to numb them before trying to extract a specimen with forceps. By January 2nd they had moved to a drill hole in the ceiling and only three of the original fifteen to eighteen remained. The hole was only twenty feet from the entrance. It is believed some of them left when the temperature rose for a few days preceding New Years.

Mr. Leo Lemay of the Natural History Society has also reported collecting ground beetles (Family *Carabidae* and probably genus *Harpalus*) beneath rocks outside the entrance during the previous summer.

SPIDERS

Wolf spider (Family *Lycosidae*)

A female occupied a drill hole about twelve feet from the entrance. Although not seen in October, several young were collected from the same hole early in December.

AMPHIBIANS

Frogs and salamanders are the most abundant of the larger fauna in the cave. The records of the Society include wood frog (*Rana sylvatica*), leopard frog (*Rana pipiens*), green frog (*Rana clamitans*), and the pickerel frog (*Rana palustris*). All have been collected during the summer. Salamander records include a red salamander (*Pseudotriton r. ruber*), which was collected at the entrance under a rock; larvae of the dusky (*Desmognathus f. fuscus*) and two-lined (*Eurycea b. bislineata*) salamanders in the cave near the entrance; their adults under rocks outside, but near the entrance; many long-tailed (*Eurycea l. longicauda*) salamanders throughout the cave. The pickerel frog, the long-tailed salamander, and dusky sala-

mander larvae are the only winter residents.

While the larvae of the dusky salamander are common, long-tailed salamander larvae have never been seen probably due to their secretiveness. The dusky larvae were quite active up to the end of December. After this date specimens could not be found in their old hiding places.

Over two dozen long-tailed salamanders could be counted on any visit before mid-November. After that time they had to be dug from crevices and drill holes.

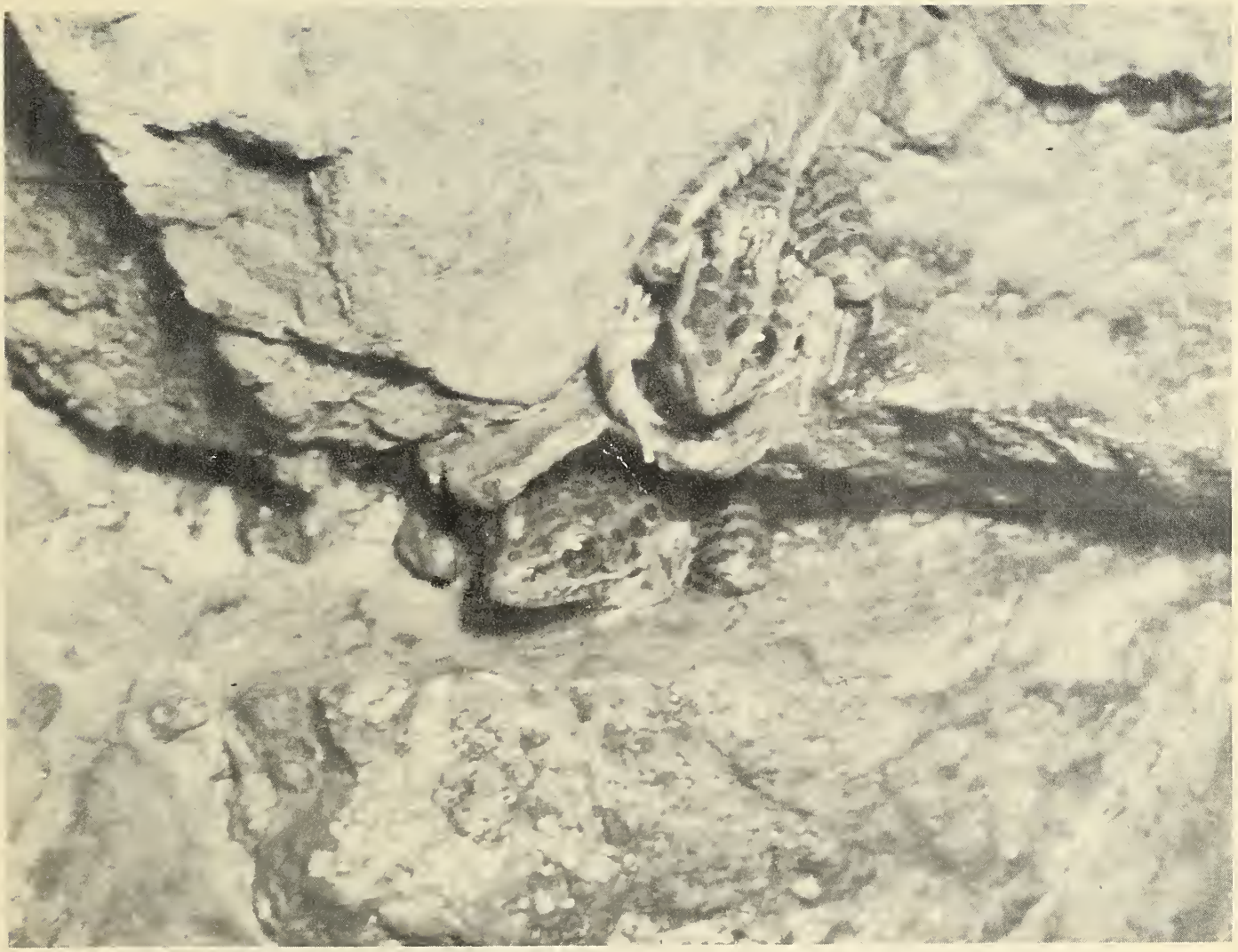
Pickerel frogs (Plate IV) back into their hiding places so that just half of their head and eyes show. In past years when air temperature in the cave dropped much lower they would become so numb that they would not jump even with prodding. The relatively high air temperature in the cave during the winter of 1949-50 probaly did not slow down their metabolic activity very much because on the author's last visit the frogs looked very lean.

MAMMALS

The only mammals in the cave are bats and records for this period are very scanty. One was seen on November 8th and on November 13th was absent. On December 11th another was seen; it remained until after December 17th. According to Bures (1948) the first one would have been Trouessart's bat (*Myotis keenii septentrionalis*); it was approximately one and three-quarters inches (body and head) long, with long ears and hibernated in a crevice with only a portion of the front half of its body protruding. The second was probably a pipistrelle or Georgian bat (*Pipistrellus s. subflavus*). It hung free, was the same size as the first, and its body hair was covered with droplets of water. The humidity of the cave contributed the water, condensing on the fur over a long period. Both bats were found at a point one hundred and forty-six feet from the entrance. Table I will show they were present when relative humidity was the highest. An explanation for their departure is offered: air temperature was not low enough to slow their metabolic activity so that they could last the winter on stored fat. Relative humidity did not remain high enough to prevent dessication. The warm spells presented an opportunity to forage for insects.

Bures (1948, p.64) adds the following notes: the big brown bat (*Eptesicus f. fuscus*) is a common year round resident of the area with specimens also having been taken in the cave, hibernating singly. *Pipistrellus* usually hangs singly. *Myotis* hibernate in groups of ten or twelve. Mansueti advises that the little brown bat, *Myotis l. lucifugus*, is the commonest bat and has been captured in the cave on numerous occasions.

Plate V



Pickerel Frogs *(Rana palustris)* This frog is a common dweller all year round. These two were photographed while they sat on a ledge about six inches above the water. This was on January 13, 1947, when the water temperature was 37°F.

BIBLIOGRAPHY

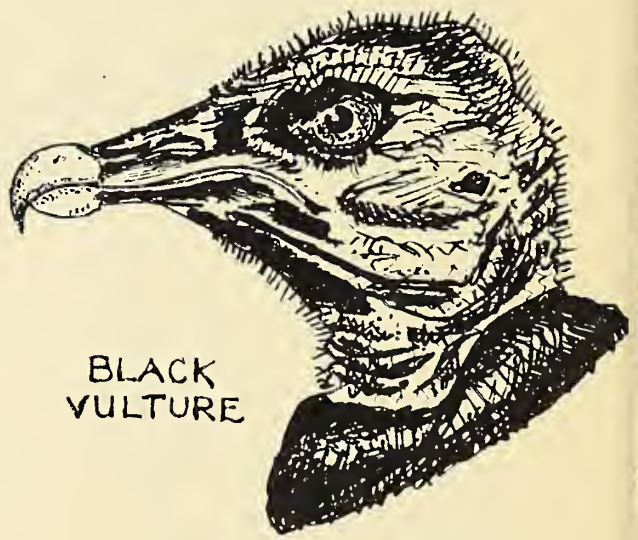
1908 Hahn, W. L. Some habits and sensory adaptations of cave-inhabiting bats. Biol. Bull., vol. 15, pp. 165-193.
1928 Johannsen, A. Maryland Geological Survey, vol. 12, pp. 202-203.
1929 Matthews, E.B. Maryland Geological Survey, Baltimore County Report, p. 284.
1939 Pearse, A.S. Animal ecology. McGraw-Hill, New York, 642 pages.
1948 Bures, J.A. Mammals of a limited area in Maryland. Maryland Naturalist, Natural History Society of Maryland, vol. 18, no. 4, pp. 6 - .

BLACK VULTURE NESTING IN BALTIMORE COUNTY

By

Thomas Smyth, Jr.

The black vulture *(Coragyps atratus)*, common in the deep South and found in the central states from Kansas to Ohio, has recently been extending its breeding range east of the Appalachians. The records assembled by Kolb (Maryland Naturalist, 19 (1): 7-9, 1949) show a steady northward advance of the vultures during the last fifty years from Southern North Carolina through Virginia and the western shore of Maryland almost to the Pennsylvania border. Nesting sites have been found in seven Maryland counties: St. Marys, Charles, Montgomery, Prince Georges, Anne Arundel, Harford, and (as reported below) Baltimore. The birds have taken up permanent residence in the region east of Washington.



On April 1, 1951, Mr. David Heese and I were exploring the steep east shore of Loch Raven Reservoir just south of the bridge near Ashland, Maryland, when we saw a vulture on a heap of boulders about fifty feet away pacing back and forth in a manner suggestive of a turkey. As we adjusted our glasses for a better look it flew heavily to a tree. Having noted the dark head and feet, and short wings and tail characteristic of the black vulture, we made an intensive search of the slope in the hope of discovering a nest. At last it was found, a single egg lying on damp earth at the back of a little cave in the rocks. A kalmia bush and a small fallen log partially hid the entrance, and even from behind them the egg was hidden from view by a bend in the middle of the eight foot tunnel.

Later in the day we returned with a larger party to check the identification of the bird. As in the morning, she came out when we approached the nest and remained in a nearby tree while we squirmed in to get a look at the egg. Two days later I returned early in the morning and with the aid of flash bulbs took a kodachrome of the egg in place.

On April 29 I made another visit, camera in hand. After shuffling my feet, stamping, hissing, clapping and uttering a final verbal salutation which failed to elicit a response from the cavity I abandoned the camera and wriggled through the rocks only to have an embarrassing encounter at the bend with the disheveled female vulture. She escaped through a small side exit and flew away, apparently not inconvenienced by the lack of two adjacent primaries from the right wing. In the nest was a young vulture, scarcely larger than the egg had been.

In addition to the female on the nest two other black vultures were seen among the turkey vultures flying over the gorge. Black vultures have also been seen near Ashland by other observers during the past year and a half. In view of the apparent trend toward an expanded range, it seems likely that the black vulture will become a regular nesting inhabitant of Baltimore County.

The Harvester Butterfly - *Feniseca tarquinius*

by

Robert S. Simmons and Charles J. Stine

The harvester is a deviation from the usual type of butterfly. Of all the species known to science there exists but a few that are not vegetarians during their larval life. Most of the carnivorous larvae occupy a tropical habitat occurring in Burma, Ceylon and Africa. The one exception in the North American species is the harvester, *Feniseca tarquinius*,(Fabricius), which is found in the Atlantic Coast States and Mississippi Valley. In all parts of its range *Feniseca tarquinius* is extremely local in occurrence. This is primarily due to the fact that the larvae are carnivarous, feeding exclusively upon "woolly" aphids (genera -*Schnizoneuna* and *Pemphigus*) which usually infest alders growing along or near running water. Since the appearance of the aphids in any one place is principally a haphazard phenomenon, the butterflies may be common in or wholly absent from a given area during different seasons or during different years. Consequently, a butterfly is exceedingly diffcult to locate at any one time. Another peculiarity of this insect is the surprising resemblance of the chrysalis to a monkey's face. Perhaps this feature serves as a protective role for the well being of the pupa.

During July, August, and September of 1950 *Feniseca tarquinius* (Fabricius) was found to be fairly common along a stream abounding with alders which were heavily laden with "woolly" aphids near Dorsey, Anne Arundel County. Although the alders were searched repeatedly the only larvae discovered were those of parasitic flies. No harvester larvae could be found. The species was again sought for during, June, July, August and September of 1951 in the same area. Aphids were present on practically every alder, but no butterflies or larvae could be found. On September 14, 1951 a locality about one-quarter of a mile downstream was investigated with no success. The following day it was again searched and proved to be productive. A single large worn female was seen and after much difficulty was finally captured. The alders were then thoroughly checked for the elusive larvae. After combing through "woolly" aphids for quite some time one alder shrub growing from beneath a small wooden bridge was discovered to harbor unusually large aphids in astonishing numbers. On one of the infected stems, only two feet directly above the running water, were seven harvester larvae.

Pupal sheath or chrysalis of the harvester butterfly, *Feniseca tarquinius (Fabricius)*, showing the monkey-face design. (Highly magnified. Actual length 3/8 inch)

Photograph by
C. J. Stine
and
E. J. Eisenmeier

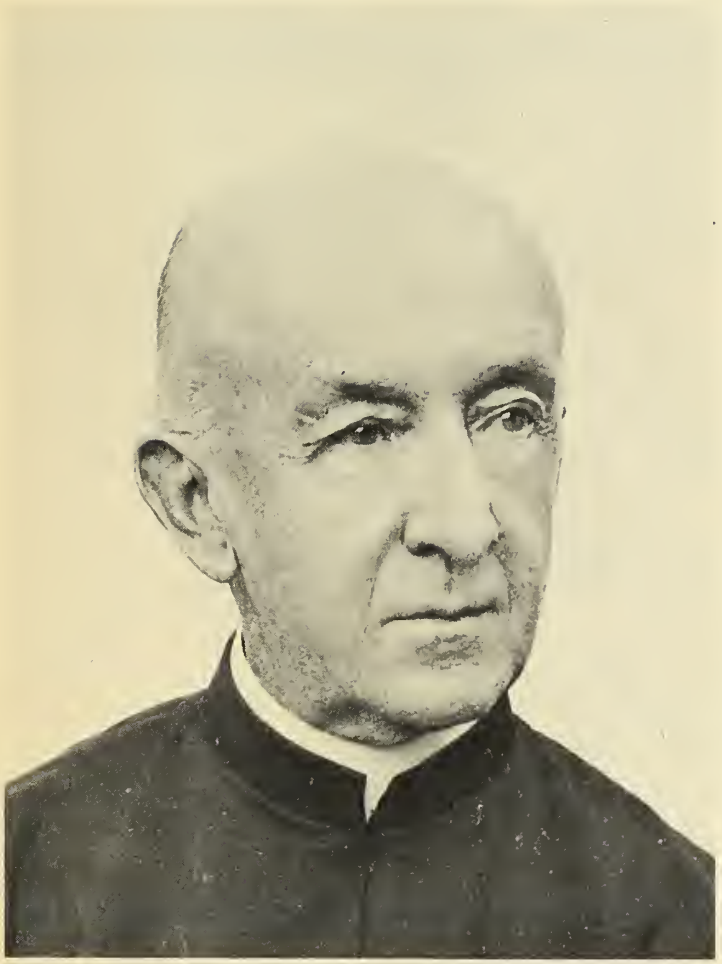
Adult Harvester butterfly - *(Feniseca tarquinius (Fabricius)* (highly magnified. Actual wing expansion 1 inch). The Harvester represents the only North American butterfly that is strictly predatory during the larval stage.

Photograph by C. J. Stine and E. J. Eisenmeier

These prizes were carefully transferred to a vivarium, along with numerous aphids, and were allowed to complete their larval life which was climaxed by pupation. Eight days after pupation one of the adults emerged. The accompanying figures portray the adult insect and the weird chrysalis (pupal sheath of figured adult).

IN MEMORIAM

Rev. William H. McClellan, S.J.



On May 8, 1951 the Society lost a most valuable and highly esteemed member and friend, Rev. William H. McClellan, S.J.

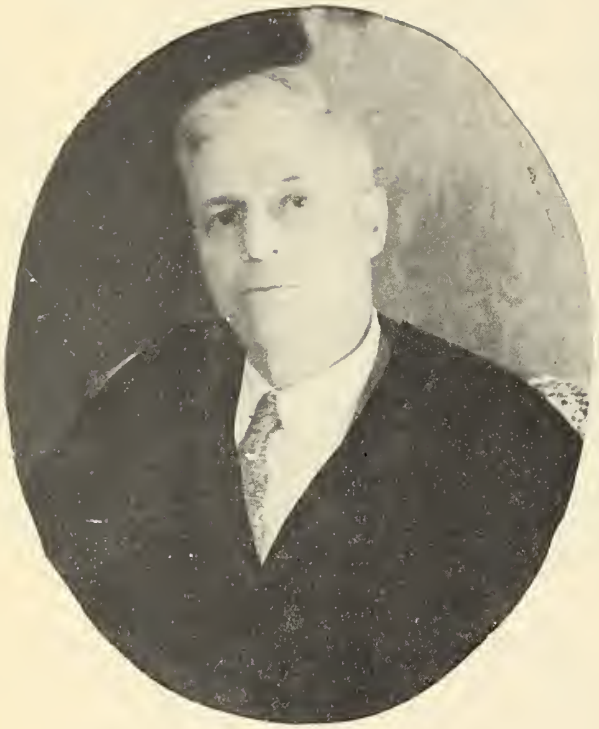
Father McClellan was born at Westchester, Pa., on March 25, 1874. After a good secondary education he spent several years working as a stenographer and private secretary. He decided to abandon the business world for a time and matriculated at the University of Pennsylvania, from which he graduated in 1899 with an A.B. degree. He then went to the General Theological Seminary of the Episcopal Church. From 1902 to May 1908 he was an Episcopal clergyman, mostly in Philadelphia. In August, 1910 he entered the Society of Jesus and was ordained a priest on May 8, 1918. Most of his time was given to Biblical studies. He was Professor of Old Testament Exegesis and Hebrew at Woodstock College, Woodstock, Maryland.

Father McClellan joined the Natural History Society of Maryland in February 1940, and almost immediately became associated with the Staff of the Society in the Department of Herpetology. He contributed many articles to the "Maryland Naturalist", the Society Journal, but his most important work published by the Society was his Proceeding No. 8, "The Lizards of Central and Southern Maryland," in collaboration with Romeo Mansueti and Francis Groves. This publication was the only one of its kind dealing with the lizards of our State and attracted much attention, both in and out of Maryland, so that the first edition was exhausted in a few years. It will be republished shortly. The work was chiefly the efforts of Father McClellan. He was a scholar, a great naturalist, a magnetic personality.

His was a most kindly and genial nature. He endeared himself to everyone with whom he had any contact.

IN MEMORIAM

Edward O. Wegner



On August 24, 1951, the Society lost one of its staunchest friends and valuable members, Edward O. Wegner.

Mr. Wegner was one of the first four members to join the Society, in November, 1929. From that time on he was most interested in the Society's work and gave his time and efforts without limit, often neglecting to his own personal needs.

He was born in Baltimore on November 12, 1879. He entered Scheib's parochial school, after which he graduated from Baltimore Polytechnic Institute, the Maryland Institute, and later received his degree of Bachelor of Engineering from the Pratt Institute of Engineering, New York. For years Mr. Wegner worked as safety engineer for the Maryland Fire Underwriters, the United States Fidelity and Guaranty Co., the United Shipping Board and a number of steamship companies.

For a long period he was on the Staff of the Society as Superintendent of Buildings. Mr. Wegner not only supervised all repairs of our two buildings, but very often made many repairs and necessary additions and installations to the Society's property personally.

He was one of the most co-operative Staff members and aided not only the administration but every department which had a problem. He was well known by all as "Uncle Ed". The Society, as well as the Staff, has lost a good and valuable friend.

NEW COUNTY RECORDS FOR THE WOOD TURTLE (*Clemmys insculpta*) IN MARYLAND

by

Robert S. Simmons and Joseph B. Hanzely, S.J.

On May 9, 1946, the writers secured a young wood turtle, *Clemmys insculpta* (Le Conte), near Woodstock, Baltimore County. Although the weather was warm and clear there persisted throughout the day a rather strong wind. The general locale of the capture was the semi-open

deciderous woods along the east bank of the Patapsco River between Woodstock and Marriottsville. The immediate area was sheltered from the wind, flat, sunny, and subject to inundation from overflows of the Patapsco River. The specimen was taken at 11:30 A.M. while crossing a small clearing.

On July 5, 1951, a medium-sized specimen was found crushed on a road near Eklo, Baltimore County, just above Pretty Boy Reservoir. Another specimen was collected by the author in the immediate vicinity on September 25, 1951. This individual was captured in a small marsh, bordered by a stream about four feet wide at the base of a steep hill. The day was clear and very cool; however, the marsh, being in a sheltered hollow, was a great deal warmer. In general the area is very hilly characterized by dense deciduous woods. When first observed (11 A.M.) the specimen was basking in the sun at the very center of the marsh on a small tuft of grass overhanging a tiny puddle. At the time the marsh was exceptionally dry due to the existing drought. Upon sighting the collectors the turtle dived from its perch and attempted to bury itself in the small mud pocket about a foot deep. It was amazing how deeply it had burrowed in such a short period. Perhaps this was its intended hibernating quarters for the coming winter.

Although both of these records are the first for the general areas involved they by no means constitute unexpected findings. On the contrary, *Clemmys insculpta* is quite abundant in the Appalachian Province (R. H. McCauley-1945) with extention into the Piedmont Plateau at various points. This is particularly true when such extensions follow the river valleys or drainage systems.

NOTE ON THE ANATOMY AND FEEDING HABITS OF A PILOT BLACKSNAKE

By
Frederick R. Williams

On the morning of September 26, 1951, a large pilot blacksnake, *Elaphe o. obsoleta,* was brought to me. It had been caught the evening before at Glenarm, Maryland, while in the act of raiding a flock of bantam chicks. A garden rake had been used to cut the head from the body 8-1/2 inches from the tip. The total length was 56 inches. The body was distended as is common immediately after feeding.

As there was not time for careful dissection at the moment the viscera were removed and placed in formaldehyde solution to await further study. The dissection showed that the head had been severed from the body just anterior to the heart and lung. The linear arrangement of the organs was particularly noticeable as was the tight binding together of the visceral mass by peritoneum. Three chicks could be distinguished through the wall of the greatly distended alimentary tract.

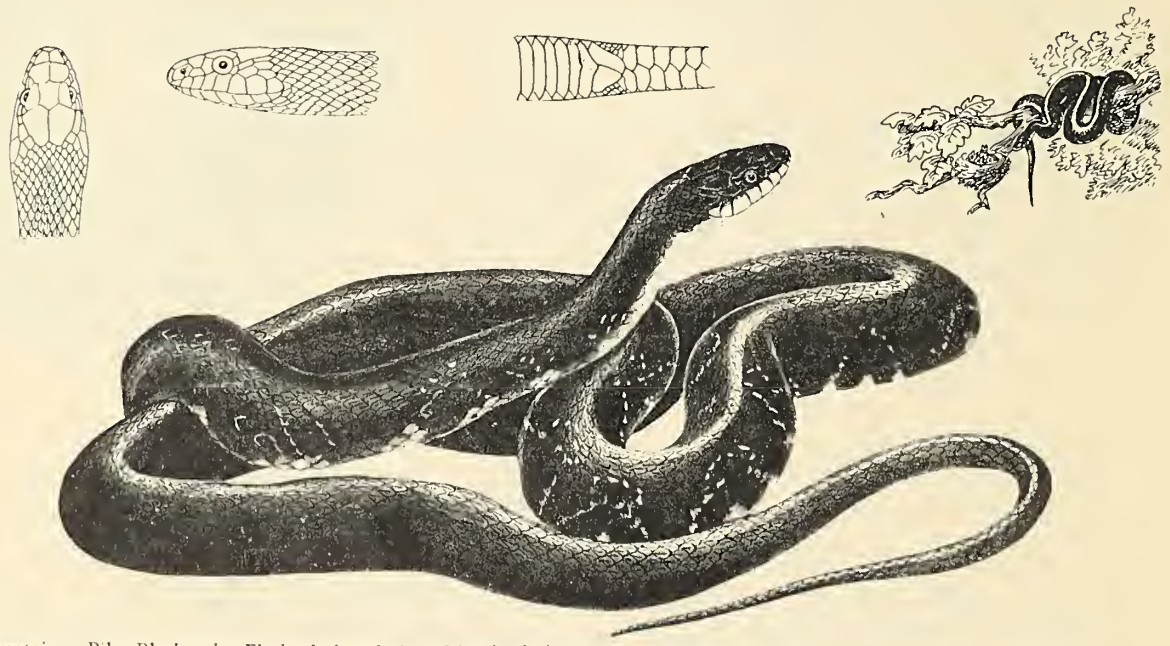
When dissection of the organs was undertaken three months later the following observations were made.

The heart measured 2 cm long and 1 cm wide.

The single lung was 8 cm long. When opened it was found to be a long sack with thick spongy walls, the inner lining of which was raised into a network of fine ridges giving a lacy appearance.

The oesophagus measured 20 cm long.

The stomach measured 20 cm long and 8 cm in circumference at its most distended part. Its wall graded in thickness from the anterior end where it was quite thin. In it were found the three chicks, all of which had been swallowed head first. Very little digestion was noticeable even of the first one. The passageway into the intestine appeared to be through a very narrow opening surrounded by very muscular walls suggesting a sphincter. The intestine was somewhat coiled. It measured 28 cm in length and tapered from about 3 cm in circumference to 1 cm where it joined the large intestine. The thickness of the wall also decreased. The lining was thrown up into numerous tightly packed longitudinal ridges.

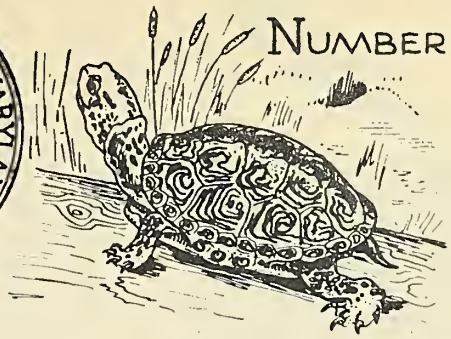


Mountain or Pilot Blacksnake, *Elaphe obsoleta obsoleta*—Maryland's longest snake. Occurs more frequently than the Black Racer to which it is not related. The scales are of uniform black, edged or dotted with white, polished, and slightly rough. (x 1/3) (*From painting by R. F. Deckert*)

The large intestine was 9 cm long. It was thinner walled and had fewer ridges and those were coarser. Except for a small mass of feathers in the large intestine the whole intestine was empty.

The dissection showed the specimen to be a male. The testes, very elongated structures, were held in the peritoneum. One measured 5 cm in length, the other 4 cm. They were not arranged exactly opposite one another. The more anterior was 30 cm from the cloaca.

Two elongated and irregular shaped kidneys, each about 10 cm long, occupied a more posterior position, and by a pair of short ureters emptied into the dorsal wall of the cloaca. Just before emptying into the cloaca they were joined by the vasa deferentia.



NUMBER 12

MARYLAND NATURE LEAFLET

INTRODUCING THE MARYLAND MAMMALS

by

Romeo Mansueti

VIRGINIA OPOSSUM

More than one hundred kinds of mammals live on the land and in the waters which make up our State of Maryland. Some of these you have undoubtedly seen many times; others are so rare or so shy that they have been seen only a few times even by biologists who are trying to study them.

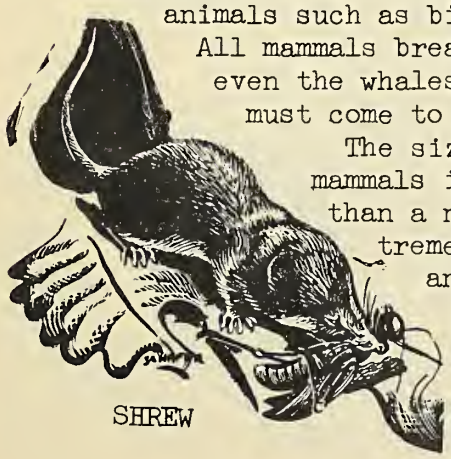
What are the mammals? Mammals are often called "quadrupeds," "four-footed beasts," or simply "animals," but none of these terms is very exact. For example, to the biologist the word animal means any living thing which is not a plant. Mammals are distinguished from all other animals by two things: they all have at least a little hair at some time during their life and the young ones are always fed with milk provided by the female. Wolves, deer, mice, and moles are all mammals. You may be surprised to learn that bats which fly through the air, whales, that swim in the sea, and even man are all mammals, too.

COMMON MOLE

Most mammals have four limbs and feet with five toes. The toes may have horny claws, nails, or hoofs. Teeth are usually well developed and the senses of sight, hearing and smell are often very acute. The greater development of the brain gives to mammals a better memory and a greater ability to learn than any of the lower backboned animals such as birds and fishes.

All mammals breathe with lungs; even the whales and porpoises must come to the surface of the seas to fill their lungs with air.

The size of mammals varies enormously. One of the smallest mammals in the world — the least shrew, which weights less than a nickel — is a native of Maryland. At the other extreme is the great blue or sulphur-bottom whale, the largest animal which ever lived, even larger than the great prehistoric dinosaurs. A young blue whale once visited our Chesapeake Bay and its skeleton can be seen



SHREW

Drawings by Charles E. Schafer are reprinted by permission of the Michigan Conservation Commission.

LITTLE BROWN BAT

to-day in the Museum of the Natural History Society of Maryland.

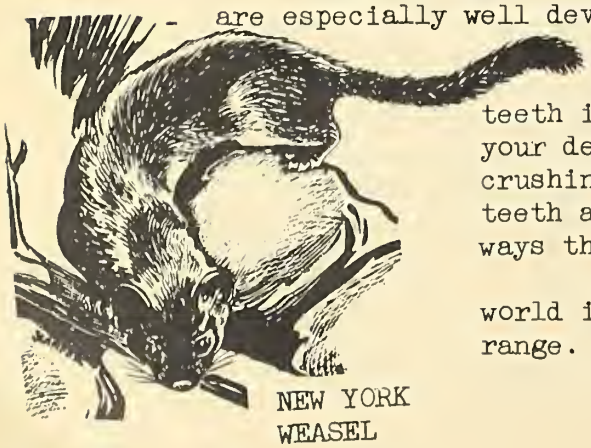
Between these two extremes the Maryland mammals show a most interesting variety of sizes, forms, colors, and habits. Swift runners, such as the deer, have narrow bodies and long limbs, while large, "lazy" kinds, such as the bears, are heavy-bodied. Whales, porpoises, and seals swim efficiently because of their streamlined bodies. Muskrats and beavers are not as completely adapted for a water life, but they have webbed feet and flattened tails which enable them to swim easily if somewhat slowly. The eyes of most mammals are placed on the sides of the head allowing a watch to be kept for enemies on both sides. The external ears are large and erect in rabbits and deer which depend upon their sense of hearing to detect enemies, but they are small or absent in burrowing moles and shrews.

In bats the forelimbs and fingers are tremendously lengthened providing a support for the wide membranes which form their wings. The flying squirrels, having no such elaborate structures, can only glide from tree to tree. Male deer grow a new set of antlers each year with which they have sparring matches during the autumn breeding season. Although the antlers of young deer are not as well developed as those of older ones, it is not possible to tell the age of a deer by the number of points on its antlers.

EASTERN BLACK BEAR

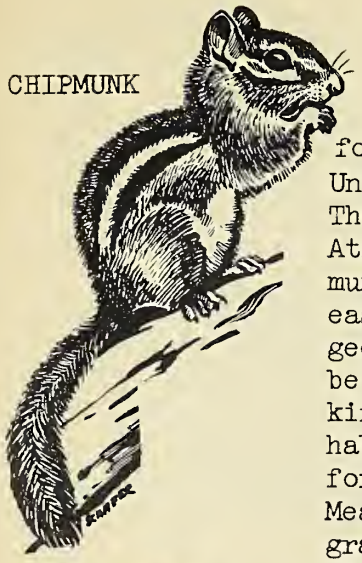
The hairy covering of mammals is known as pelage. In Maryland it is heaviest in the mammals which live in our western mountains and thinnest in those found in the lowlands. The pelage is molted periodically, usually in the fall. In western Maryland the snowshoe or varying hare has a brown summer coat which is replaced by a white one for the winter; thus these hares are provided with a protective coloration at both seasons. Special hairs called "whiskers" are found about the eyes and nose of many mammals. These hairs are connected with especially sensitive nerves in the skin and provide the mammal which possesses them with a great deal of information about its environment. This is a particularly important matter for animals such as moles and shrews which have little or no sense of sight.

While teeth are found in most of the lower backboned animals, they are especially well developed in mammals. There is an almost endless variation among the teeth of mammals but there are three main types which can be illustrated by the teeth in your own mouth: a biting type (called incisors by your dentist), a tearing type (the "eye teeth"), and a crushing type (the molars). The number and form of the teeth are so characteristic that they are one of the best ways the scientist has to identify strange species.



NEW YORK WEASEL

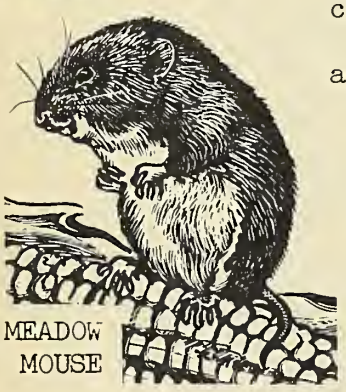
Each kind of mammal has a definite part of the world in which it lives. This is called its geographical range. Most of the mammals found in Maryland can also be



CHIPMUNK

found over the greater eastern part of the United States, and some much farther away. The great blue whale roams over both the Atlantic and Pacific Oceans but the chipmunk ranges only from Georgia to Ontario east of the prairies. Even within its geographical range no kind of mammal can be found everywhere. Each has a certain kind of place in which it lives, its habitat. You will not find muskrats, for example, along a rocky mountain cliff. Meadow mice stay out of the woods, while gray squirrels like to have trees to climb.

RACCOON



MEADOW MOUSE

It is not as easy to study mammals as it is to study birds because many of them are active only at night or are otherwise careful not to allow themselves to be seen. On the other hand, not as much is known about them. Anyone who wishes to be a real explorer can with patience and effort add new facts to our store of knowledge of Maryland mammals.

Eight large groups of mammals are represented in Maryland by one or more species:

1. Order of Marsupials, mammals which carry their young about after birth in pouches; only the opossum in Maryland.

2. Order of Insectivores, primitive mammals living largely on insects; moles and shrews in Maryland.

3. Order of Bats, the only mammals which can truly fly rather than glide; at least ten kinds in Maryland.

4. Order of Rodents, the gnawing animals; the largest group of Maryland mammals including squirrels, rats, mice, woodchucks, and rabbits.

5. Order of Carnivores, the flesh-eating animals. The foxes, bobcats, bears, raccoons, weasels, skunks, mink, and otters belong to this group.

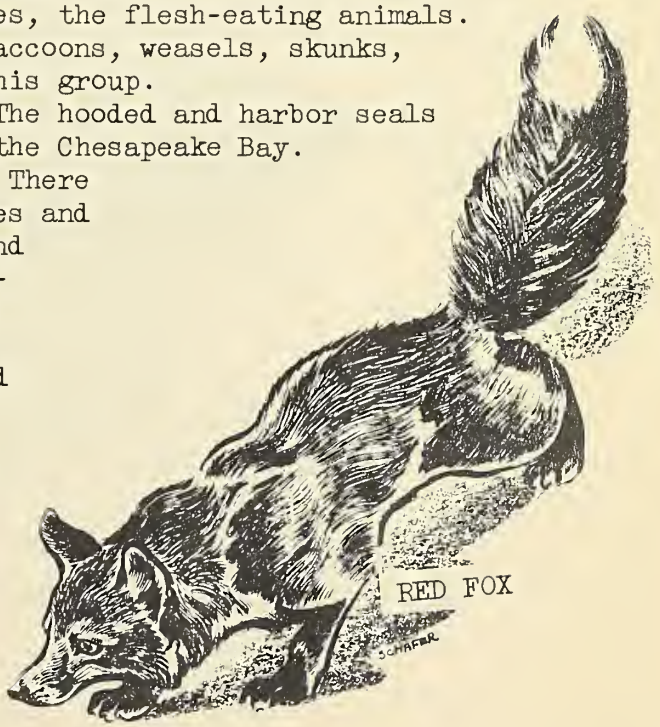
6. Order of Seals. The hooded and harbor seals have sometimes straggled up the Chesapeake Bay.

7. Order of Whales. There are various kinds of porpoises and larger true whales to be found along our short Atlantic seacoast; they very rarely come up the Bay.

8. Order of Even-toed Hoofed Mammals. Today only the deer belongs to this group in Maryland but in the olden days there was also the buffalo or bison.

VARYING HARE

MUSKRAT



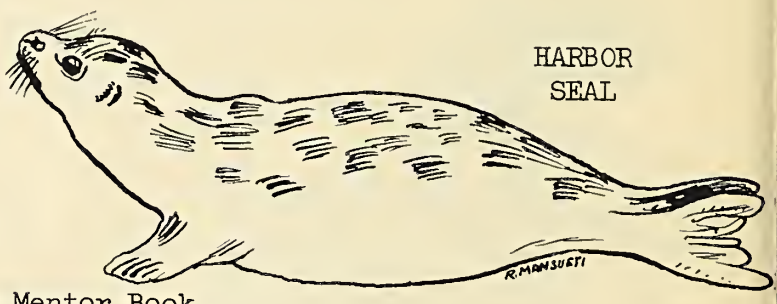
RED FOX

The mammals have always been important to the people who live in Maryland. To the Indians they represented both food and clothing. The first white

WHITE-TAILED DEER

settlers shot deer and bear for food and trapped beaver, mink, and muskrats for their furs. As the country developed, wolves and mountain lions became a menace to farmers and their domestic animals and had to be exterminated. Today mice, rabbits, and woodchucks are still serious enemies of the farmer. No one depends upon wild mammals for food, but many people find recreation in hunting, and supplying the hunters with their needs is an important business. In late years hunting with a camera has become popular because it requires even greater skill and patience than hunting with a gun. On the Eastern Shore especially, the trapping of muskrats for their fur is a big business.

If you would like to learn more about our mammals, the following references, which can be obtained from the Natural History Society will aid you:



HARBOR SEAL

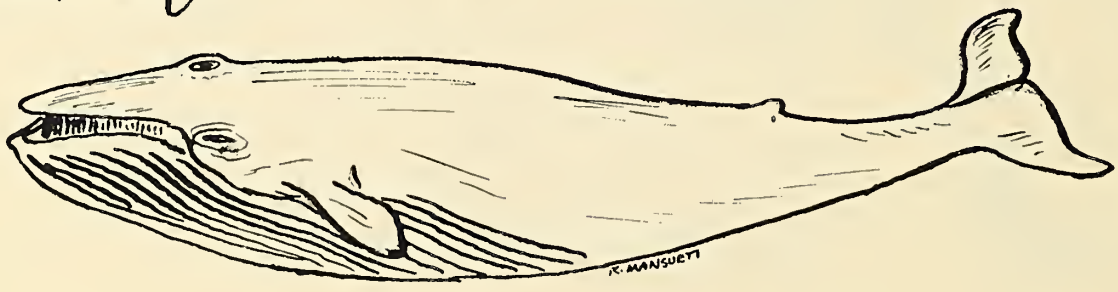
Burt - A Field Guide to the Mammals: Houghton, Mifflin Co.

Sanderson - How To Know The American Mammals: a Mentor Book

Mansueti - Extinct and Vanishing Mammals of Maryland: The Natural History Society of Maryland.

BOTTLE-NOSE DOLPHIN

FINBACK WHALE



MARYLAND NATURE LEAFLETS are edited for school use by Haven Kolb. They are available in reprint form at 8 cents each. Send for a list of titles to

THE NATURAL HISTORY SOCIETY OF MARYLAND - 2101 Bolton St., Baltimore 17, Maryland

Publications of
The Natural History Society of Maryland

A LIST OF THE BIRDS OF MARYLAND

Paper cover, 96 pages, 9 illustrations. A list of all the species of birds now known to occur in Maryland. Brief annotations give information concerning seasons of occurrence and regional distribution. Price $1.10

MINERALS OF MARYLAND

Paper cover, 92 pages, 20 illustrations. Contains check-list of all known minerals of Maryland and principal locations. Price $.80

SNAKES OF MARYLAND

Paper cover, 103 pages, 11 plates in color and 33 black and white. Contains identification keys and distribution map. Price $1.50

FAMILIAR BUTTERFLIES OF MARYLAND

Paper cover, 30 pages, 1 plate in color and 16 black and white plates illustrating 40 common butterflies of Maryland. Price $.20

FAMILIAR MOTHS OF MARYLAND

Paper cover, 19 pages, 9 plates illustrating 11 common moths, principally the larger species, found in Maryland. Price $.15

BIRDS OF BALTIMORE AND VICINITY

Paper cover, 24 pages, map. Contains arrival, departure and nesting dates; arranged according to seasonal groups. Space is provided for additional records. Price $.15

THE PERIODIC CICADA

Leaflet of 4 pages describing the complete life history of the "Seventeen Year Locust." Price $.08

No. 10. SOME INDIAN VILLAGE SITES IN LOWER PATAPSCO RIVER

Another excellently illustrated report on Indian artifacts from Anne Arundel County. 6 pages, 5 half-tones, 1 map. Price $.35

MARYLAND NATURE LEAFLETS

A series of 4 page leaflets, 8½" x 11", each profusely illustrated with line drawings, and with vocabulary especially adapted to middle high school grades. *Prices:* 8 cents each for ten or less; all over ten, 6 cents each, any assortment.

#1 Maryland Maples
#2 Maryland Salamanders
#3 Winter Birds in Maryland
#4 Maryland Frogs and Toads
#5 Queer Fishes of the Chesapeake
#6 Turtles of Maryland
#7 Spring Flowers in Maryland
#8 Common Fresh Water Fishes of Maryland
#9 Common Maryland Insects
#10 Our Maryland Indians
#11 Maryland Tree Frogs
#12 Introducing Maryland Mammals

The Natural History Society of Maryland

Founded 1929

"To increase and diffuse knowledge of Natural History"

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01371 7509

OFFICERS AND STAFF

EDMUND B. FLADUNG, *President*

HERBERT C. MOORE, *Vice-President* — C. HAVEN KOLB, JR., *Secretary*

ELRA M. PALMER, *Treasurer*

BOARD OF TRUSTEES

EDMUND B. FLADUNG
IRVING E. HAMPE
OSCAR HELM
EDMUND B. KELLY, M.D.
GILBERT C. KLINGEL
C. HAVEN KOLB, JR.
HERBERT C. MOORE
T. MILTON OLER, JR.
ELRA M. PALMER
FREDERICK A. SAFFRAN
AARON STRAUS
J. CAREY TAYLOR

The Mayor of Baltimore,
THOMAS D'ALESANDRO
(ex-officio)

Mineralogy

CHARLES W. OSTRANDER, *Curator*
WALTER E. PRICE, JR., *Associate*
L. BRYANT MATHER, JR., *Associate*
CHARLES W. SMITH, *Associate*
WILLIAM J. ENGELBACH, *Assistant*
HAROLD LEVEY, *Assistant*
CHARLES FREED, *Assistant*

Geology and Palaeontology

OSCAR HELM, *Curator*
ELRA M. PALMER, *Associate*
JOHN B. CALDER, *Associate*
MANFRED WASERMAN, *Assistant Curator*
JOSEPH SCHREIBER, JR., *Assistant*
MAX GOUDY, *Assistant*

Botany

EARL H. PALMER, *Curator*
JOHN P. HILL, *Assistant*

Marine Life

DONALD CRAWFORD, SR., *Curator*
FRANK C. YINGLING, *Associate*
DONALD CRAWFORD, JR., *Assistant*

Entomology

HENRY EICHHORN, *Curator*
WILLIAM MOOREFIELD, *Associate*
HENRY HOWDEN, *Consultant*
LEO LEMAY, *Junior Assistant*
ANTHONY MARSIGLIA, *Junior Assistant*

Herpetology

GEORGE W. MAUGANS, *Curator-in-Chief*
ROMEO MANSUETI, *Curator of Collections*
JAMES A. FOWLER, *Associate*
ELIAS COHEN, *Associate*
FRANCIS GROVES, *Associate*
JOHN E. COOPER, *Assistant*
DOUGLAS OLER, *Assistant*
DANIEL LYONS, JR., *Assistant*

Ornithology and Mammalogy

IRVING E. HAMPE, *Curator-in-Chief*
HENRI SEIBERT, *Associate*
HERVEY BRACKBILL, *Associate*
C. HAVEN KOLB, JR., *Curator*
JOSEPH GENTILE, *Curator*
GORMAN M. BOND, *Assistant*
ROBERT M. BOWEN, *Assistant*
ROBERT LAMBERT, *Assistant*
JOHN DELANEY *Junior Assistant*

Archaeology

RICHARD E. STEARNS, *Curator*
T. MILTON OLER, JR., *Assistant*

Library

C. HAVEN KOLB, JR., *Librarian*
HENRY EICHHORN, *Assistant*

Photography

AUGUST SELCKMANN, *Curator*
ANTHONY G. MARSIGLIA, *Assistant*
JAMES TOLAND, *Assistant*

Publication

HERBERT C. MOORE, *Editor*
C. HAVEN KOLB, JR., *Assistant Editor*
JOHN COOPER, *Assistant Editor*

Education

ELRA M. PALMER, *Director*
JOHN B. CALDER, *Assistant*

Museum

T. MILTON OLER, JR., *Curator*
ROMEO MANSUETI, *Assistant*
JOHN COOPER, *Assistant*
FREDERICK A. SAFFRAN, *Public Relations*

OFFICE, LABORATORIES and LECTURE ROOM
2101-2103 Bolton Street
Baltimore 17, Md.

Office Hours: Tuesday 10 A. M. to 4 P. M. — *Telephone:* MAdison 9644

Open Tuesday, Friday and Saturday evenings from 8 to 10 P. M.